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1 Electronic Apparatus Having Connecting Means

BACKGROUND OF THE INVENTIONField of the Invention

5 The invention relates to an electronic apparatus and, more particularly, to an electronic apparatus in which a detachable IC card is connected to an IC card junction portion and a CPU bus of the electronic apparatus main body is connected to the
10 IC card by the junction portion and the IC card is used as an external memory device.

Related Background Art

 Fig. 8 shows an external view of a conventional data processing apparatus such as personal computer, word processor, or the like and an IC card which is
15 used as a small external memory device for the data processing apparatus.

 A construction of a data processing apparatus 90 shown in Fig. 8 is used in a word processor, a
20 personal computer, or the like and has a display 68 comprising an LCD panel or the like and a keyboard 86 as user interface means. The apparatus 90 also has an IC card 50 as an external memory device. Reference numeral 91 denotes an eject lever to remove the IC card
25 50.

 As shown in Fig. 9, a control system of the data processing apparatus 90 comprises: a CPU 65;

1 various control circuits which are connected to a data/address bus of the CPU 65; the display 68; a power source (P/S) section 84; and the key input section 86.

5 The IC card 50 is connected through an IC card connector 60 in a slot which is formed in the side wall of the keyboard 86 in Fig. 8.

10 The IC card is used as a memory area to store processing data of the apparatus main body, operation data or KANJI (Chinese characters) font data which has already been stored in the card, or data of utility softwares, or the like.

15 A plurality of read only memories (ROMs) 54 and a plurality of random access memories (RAMs) 55 are enclosed in the IC card 50 and are connected to the IC card connector 60 through a buffer 53 and a junction portion 51 by an address/data/control bus 56.

20 The address/data/control bus of the data processing apparatus 90 and signal lines of a power source and the like are also connected from the apparatus main body to the IC card connector 60 through a buffer 62 as necessary as shown in Fig. 10. The signal is connected to the IC card 50 by the connector.

25 To the address/data/control bus of the CPU 65, there are connected: a KANJI (or Chinese characters) ROM 69; a DMA controller 70; an RAM 82; an ROM 83; a timer 81; an I/O controller 71; a display

1 controller 66 to control the input/output operation
for the display 68 and keyboard 86; a key input
controller 85; and the like.

5 An external expansion bus connector 89 is
provided on the rear wall (not shown in Fig. 8) of
the main body. A hard disc or an external control
unit can be connected to the external expansion bus
connector 89 through an exclusive control board and
can be used to expand the external memory or to
10 control the apparatus.

In recent years, the realization of miniaturization of the apparatus is more and more progressed. In the apparatus as mentioned above, it is becoming impossible to provide a space enough to attach both
15 of the connector 60 for the IC memory and the external expansion bus connector 89. For instance, there are also commercially available a portable data processing apparatus and the like such as IC card system pocket-book, IC card electronic calculator, and the like
20 having a small space only for providing a connector terminal for the IC card.

On the other hand, in such an apparatus as well, a high function such as a high processing speed to input/output data from/to an external apparatus or
25 the like is required similarly to the case of a desktop type personal computer or the like.

As mentioned above, however, in recent years,

1 it is difficult to assure an installation space of
the connector to input/output for an external device.
In the conventional construction, there is a case of
using a countermeasure such that the control of the
5 external device and data input/output operation are
executed or the like by using a serial communication
connector. This is because an installation space
for the serial communication connector is smaller
than that for the external expansion bus connector
10 since the serial communication connector has only a
signal line.

According to the above method, however, the
high-speed input/output operation cannot be executed
by the communication using the serial communication
15 connector. Such a method can be used for only an
interface with a relatively low-speed external device
such as printer, analog modem, or the like. It is
difficult to apply the above method to an application
field such that the memory of the IC card of a small
20 capacity is expanded by connecting an external memory
or the like.

SUMMARY OF THE INVENTION

It is the first object of the invention that
25 even in a small electronic apparatus having a limited
installation space, the data input/output operation can
be executed at a high speed by using an IC card

1 interface.

The second object of the invention is to enable the input/output operation with an external device such as an external memory device or the like to be performed through pseudo card means connected under the same junction condition as that for the IC card connector.

BRIEF DESCRIPTION OF THE DRAWINGS

10 Fig. 1 is a perspective view showing an external view of a data processing apparatus employing the invention;

Fig. 2 is a block diagram of a control system of the apparatus of Fig. 1;

15 Fig. 3 is a diagram of a table showing a pin arrangement of a junction portion on the pseudo IC card side;

Fig. 4 is a flowchart showing the operation of the apparatus of Fig. 1;

20 Fig. 5 is an explanatory diagram showing a data construction to distinguish between an IC card and a pseudo IC card;

Fig. 6 is a block diagram showing an embodiment of a different control system of the electronic apparatus;

25 Fig. 7 is a perspective view showing a state in which the invention is applied to an electronic camera;

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1 Fig. 8 is a perspective view showing a
construction of a conventional electronic apparatus;
and

Fig. 9 is a block diagram showing a construction of a control system of the conventional electronic apparatus.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention will be described in detail
10 hereinbelow on the basis of an embodiment shown in
the drawings. In the following description, the same
or corresponding members as those of the conventional
apparatus are designated by the same reference numerals
and their detailed descriptions are omitted.

15 According to the invention, an external device
 (an expansion port of an external expansion memory
 device such as floppy disk, hard disk device, semi-
 conductor memory, etc., another apparatus such as
 computer, word processor, etc., or the like) is
20 connected to the data processing apparatus 90 by
 using an IC card interface.

As shown in Fig. 1, in an electronic apparatus using the invention, a pseudo IC card (second card) 1 is inserted into an IC card slot (inserting hole) and used in place of the IC card (first card) 50. The pseudo IC card 1 is constructed as a pseudo IC card section. The CPU of the data processing

1 apparatus 90 executes the input/output operation to
the same interface as the ordinary IC card 50 for the
pseudo IC card 1, so that the CPU can perform the
input/output operation to an external device 11.

5 The pseudo IC card 1 has a cable 8 to execute
the input/output operation to the external device 11.
The cable 8 is connected to the external device 11
through connectors 9 and 10. In the above construction,
since the input/output interface between the pseudo IC
10 card 1 and the external device 11 can be executed
irrespective of the data processing apparatus 90 side,
it can be performed by arbitrary means such as an SCII
interface or the like.

Explanation will now be made hereinbelow with
15 respect to an example in which the external device 11
is constructed as an external expansion memory device
such as floppy disk, hard disk device, semiconductor
memory, or the like and supplements the capacity of
the IC card and data is handled as if the apparent
20 capacity of the IC card when it is seen from the data
processing apparatus 90 increased.

In Fig. 2, in a manner similar to the conven-
tional apparatus, the data processing apparatus 90 is
constructed by the display 68, power source section
25 84, and key input section 86 and has the IC card
connector 60 on the side wall of the apparatus main
body at a position adjacent to the key input section.

1 In a manner similar to the conventional
apparatus, internal circuits of the data processing
apparatus 90 comprise: the RAM 82 to store data or
utility softwares; the timer IC 81 which is used to
5 calculate an execution period or an operation time;
the key input controller 85 to convert a key input
code from the key input section 86 into a code in a
form which can be easily read by the CPU 65; the
display controller 66 to convert display characters
10 sent from the CPU 65 so as to be displayed by the
display 68 such as LCD or plasma display; the KANJI
(or Chinese characters) ROM 69 which is referred
as necessary to convert the display characters to the
display 68 into KANJI; the I/O controller 71 of a
15 communication control IC such as an RS232C or the like
for communication with the outside; the DMA controller
70 to control a DMA (direct memory access) from the
I/O controller 71; and the like.

 The apparatus of the invention differs from
20 the conventional apparatus with respect to points that
the pseudo IC card 1 is not constructed so as to use
the self internal memory as in the IC card but has
an external device controller 4 to control the
input/output operation to the external device 11, an
25 I/O driver 5, a mold member 6 to connect the cable 8
and the I/O driver 5, and a monitor 7 to assure the
safety.

1 A buffer 3 receives an input/output signal for
the apparatus main body from a junction portion 2 and
electrically protects the internal circuits. The
external device controller 4 converts the signal from
5 the buffer into a signal timing of the external device.
The I/O driver 5 is provided to execute the input/
output operation to the external device 11 by a
predetermined interface system (SCII or the like)
which can accurately perform the communication
10 between the external device controller 4 and the
external device 11 even when the cable 8 is long to a
certain extent.

Further, the monitor 7 monitors a power
source voltage which is supplied from the data
15 processing apparatus 90 to the pseudo IC card 1 through
the junction portion 2 and gives a reset signal to the
external device controller 4 at a time point when the
power source voltage is lower than a predetermined
voltage, thereby preventing a runaway of the CPU.

20 Fig. 3 is a table diagram showing a pin
arrangement of two rows of the junction portion 2 of
the pseudo IC card 1 in order to connect the pseudo
IC card 1 with the data processing apparatus 90.
Numbers in the table indicate the pin numbers and
25 each signal name is shown by a code which is generally
used. For instance, GND indicates a ground potential;
 D_0 to D_n denote bits of the data bus; A_0 to A_n bits

1 of the address bus; CS chip enable; and NC non-connection.

The operation in the above construction will now be explained with reference to Figs. 4 and 5.

5 Fig. 4 shows a control procedure of the data processing apparatus 90 by the CPU 65.

When a power source is turned on in step S1 in Fig. 4, the CPU 65 starts the execution of the operating system software of the data processing
10 apparatus stored in the ROM 83 and starts to check the function of each of the internal ICs.

In the next step S2, directory management data stored in the head address of the IC card 50 or pseudo IC card 1 as shown in Fig. 5 is read in order
15 to automatically discriminate whether the IC card has been connected or the pseudo IC card has been connected to the IC card connector 60.

Fig. 5 shows information for the CPU 65 to handle the IC card 50 or pseudo IC card 1 as a file.
20 Such information is stored into addresses 0 to 4 of the IC card 50 or pseudo IC card 1.

As shown in the diagram, different kinds of data are stored into those addresses by the IC card 50 or pseudo IC card 1.

25 Information (01 (hexadecimal notation) in the case where the device is an RAM card; 02 in the case of ROM card; F0 in the case of the pseudo IC card 1)

1 indicative of the kind of IC card 50 or the dis-
tinction between the IC card 50 and the pseudo IC
card 1 is stored into address 0.

5 In the case of the IC card 50, words (stored
in addresses 1 and 2) indicative of the number of
registered files and words (stored in addresses 3 and
4) indicative of the head address of the first file
are stored into subsequent addresses 1 to 4. Necessary
file location information is stored into the sub-
10 sequent addresses.

In the case of the pseudo IC card 1, the head
address of a device driver program to access to the
pseudo IC card 1 stored in the ROM 83 on the apparatus
main body side is stored into addresses 2 and 3.

15 In step S2, the data indicative of the kind
of device in address 0 is read and when the data kind
indicates the IC card, the processing routine advances
to steps S3 and S5. An ordinary IC card control driver
software written in the ROM 83 is loaded into the RAM
20 82. The CPU 65 sequentially executes programs stored
in the RAM 82 and controls a method of giving a signal
to the IC card connector and handles the IC card 50 as
an ROM card or an RAM card. The above operations are
substantially the same as those in the conventional
25 apparatus.

On the other hand, in the case where the read
directory management data indicates the pseudo IC card

1 in step S2, step S4 follows and the device driver
program for the pseudo IC card control is loaded from
the ROM 83 into the RAM 82. After that, in the run
of the operating system in steps S6 to S8, the CPU
5 65 sequentially executes the programs in the RAM 82
and changes a method of giving signals to the IC card
connector 60 to a method of giving control signals
according to the kind of external device which is
connected.

10 On the pseudo IC card 1 side, a high-speed
communication by parallel transfer using the CPU
bus is executed between the data processing apparatus
90 and the CPU 65. The external device controller 4
executes the necessary data conversion or interface
15 conversion on the basis of the high-speed communi-
cation, thereby performing the input/output operation
to the external device 11.

As mentioned above, the electronic apparatus
can be used for expansion of an external memory or for
20 control of an external device by using the IC card
connecting portion of the data processing apparatus 90
through the pseudo IC card 1 in which the shape, signal
arrangement, and characteristics are the same as those
of the IC card section. Therefore, even in a small
25 data processing apparatus such that there is no
space enough to attach a connector terminal for
expansion of an external memory and only a slot

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1 (inserting hole) of an IC card can be arranged, the
transmission and reception of data with an external
device can be realized by the high-speed parallel
data transmission using the CPU bus.

5 In the above embodiment, the device driver
program to execute the input/output operation to/from
the pseudo IC card 1 is stored into the ROM 82 on the
data processing apparatus 90 side. As shown in Fig.
6, however, it is also possible to construct in a
10 manner such that an ROM 12 is provided for the pseudo
IC card 1 and a device driver program to execute the
interface which is peculiar to the pseudo IC card 1
is stored therein and is transferred to the RAM 82 on
the apparatus main body side at the start of the
15 program.

In the above case, when it is determined that
the pseudo IC card 1 is connected in the discrimination
about the device in step S2 in Fig. 4, for the access
procedure, the device driver program is loaded not
20 from the RAM 82 but from the ROM 12 in the pseudo IC
card 1 in step S4.

According to the above construction, a device
driver such that the use of the pseudo IC card 1 will
not be presumed in future doesn't need to be stored
25 into the main memory in vain. The main memory
comprising the ROM and RAM on the main body side of
the data processing apparatus 90 can be saved and

1 effectively used.

Since the device driver program is stored in the pseudo IC card 1, the change and maintenance of the device driver program can be also easily performed.

5 Further, in the above embodiment, although the data processing apparatus has been considered as an electronic apparatus which handles characters such as word processor, note-shaped personal computer, electronic pocketbook, or the like, the invention is
10 also effective for all of apparatuses using an IC card such as electronic calculator which handles numerals, facsimile apparatus which handles a video image, electronic camera, and the like.

Fig. 7 shows a schematic diagram when the
15 invention is applied to an IC card camera. Fig. 7 shows an electronic camera which stores photographed images into the IC card 50. Reference numeral 202 denotes a flash to photograph and 203 indicates a lens to photograph. The other construction of the camera
20 mechanism is substantially the same as that of the conventional apparatus except a different point that in the control system of the camera, the portion which handles the interface of the IC card 50 is constructed as shown in Fig. 1 or 6 to thereby
25 enable the pseudo IC card 1 as mentioned above to be connected.

According to the above construction, the

1 external device 11 can be connected through the pseudo
IC card 1 in place of the IC card 50 and the number
of photographed images of about tens of images can be
remarkably increased.

5 In the above embodiment, upon start of the
program, the discrimination between the pseudo IC card
1 and the IC card 50 and the setting of the device
driver are executed. Upon exchange of the pseudo
10 IC card 1 and IC card 50, the discrimination about
the device, the loading of the device driver, and the
like can be also dynamically performed.

Further, in the above embodiment, the pseudo
IC card 1 and the external device are connected by
using the cable. However, the cable is not an
15 indispensable element and the pseudo IC card 1 can be
also directly attached to the external device.

As will be obviously understood from the above
explanation, according to the invention, in an
electronic apparatus in which a detachable IC card is
20 connected to the IC card junction portion and the CPU
bus of the electronic apparatus main body is connected
to the IC card by the junction portion and the IC card
is used as an external memory device, there is provided
the pseudo card means having a junction portion which
25 can be connected to the IC card junction portion of the
electronic apparatus main body, and further, the pseudo
card means has therein the control means for converting

1 the data input/output interface between the electronic
apparatus and the pseudo card means and the data
input/output interface between a predetermined external
device and the pseudo card means, and the data input/
5 output operation is executed between the electronic
apparatus main body and the external device through
the pseudo card means. Therefore, there is an
excellent advantage such that even in a small data
processing apparatus in which the connector terminal
10 for expansion of an external memory cannot be
separately attached, the data input/output operation
can be executed between the apparatus main body and
an external device at a high speed by using the bus
of the IC card through the pseudo card means connected
15 to the IC card junction portion.

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